

PARADIP PORT AUTHORITY

Mechanization of CQ-I & CQ-II Berths on BOT basis Request for Proposal – Replies to Pre-Bid Queries

CORRIGENDUM-I

No. ENG/PIO/1650/CQ1and2/2025/505, dt.26.03.2026

**MECHANIZATION OF CQ-I & II BERTHS ON BOT BASIS
REQUEST FOR PROPOSAL – REPLIES TO PRE-BID QUERIES**

Sl. No.	Clause/ Reference	Queries	PPA Clarifications
1.	General	Export Cargo Handling - Can bidder have one unloading and one loading circuit in CQ I, II to handle export bulk cargo as traffic projections are envisaged in TEFR report.	The permitted cargo in the Terminal is all dry bulk cargo, both exports & imports. As such, Bidders, based on type of cargo and nature of handling, can design the Terminal facilities to the tune of 18 MTPA capacity.
2.	TEFR/ Clause 4.2.1	Will PPA increase the existing draft from 15 mts to 17 mts to enable bidders to handle Cape Size Vessels, TEFR indicates vessel displacement from Supramax to Capesize vessels at both the berths.	The CQ-I & CQ-II berths are existing operational berths and are a part of the central dock wherein permissible draft is 14.5 mts. Bidders to note and submit their bids considering that vessels up to 14.5 mts draft will be handled in the CQ-I & II berths.
3.	TEFR/ Clause 4.8.1.2	Can bidder increase the storage capacity of RLS from 2000 MT to 4000 MT.	Based on the cargo profile to be handled by the selected Concessionaire, the Concessionaire has flexibility to design and construct the project facilities with ancillary equipment based on the broad parameters indicated in the Scope of Work (Appendix-4 of the DCA) to achieve designed capacity of 18 MTPA. Detailed Project Report covering the project facilities with ancillary equipment for the cargo identified by the Concessionaire has to be submitted to Independent Engineer for approval.
4.	TEFR/ Clause 6.1	Kindly let us know the number of rail sidings to be developed by bidder for evacuation of rakes.	The permitted cargo in the Terminal is all dry bulk cargo, both exports & imports. Based on the cargo profile to be handled by the selected Concessionaire, the Concessionaire is required to undertake Detailed Engineering covering designs and preparation of construction drawings which shall also include the Railway DPR & ESP drawings. The Railway DPR & ESP drawings covering the Railway facilities, layout, Rail sidings etc. will be prepared and approval taken from the Competent Authority by the Concessionaire for execution of the Rail connectivity works.

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Sl. No.	Clause/ Reference	Queries	PPA Clarifications
5.	DCA/ Appendix 4	Request confirmation whether the proposed rail track layout has been reviewed and approved by Indian Railways. Further, please confirm whether the Detailed Project Report (DPR) for the same is available and can be shared for our reference.	Please refer to the reply at Sl. 4.
6.	General	What will be the distance from berth to back up yard, which is earmarked for CQ I, II	The location of the CQ-I & II berths and proposed backup yard has been indicated in the TEFR (Ref: Figure 4-3). The distance from the berth to backup yard is around 2 Km.
7.	DCA/ Article 7.1	Please confirm the design vessel size that can be handled on both the berths in terms of LOA Beam, Draft, Air Draft, parcel size etc. Please also share the "Berthing Mechanism & restrictions" for CQ1 & CQ2 berths w.r.t. berthing in other nearby & opposite berths etc.	Bidders may submit their bids considering that vessels up to 14.5 mts draft can be berthed at the CQ-I & II berths. Please refer Article 7.1(b)(ii) of the DCA regarding vessel berthing policy applicable for the project.
8.	DCA/ Article 7.1	Please share the mechanism & frequency for maintenance dredging by the Concessioneing Authority.	Maintenance Dredging is an obligation listed under the Concessioneing Authority's scope and the same will be routinely carried out by PPA to ensure berthing of vessels up to 14.5 mts draft.
9.	DCA/ Appendix 8	Please share the existing Environmental Clearance & EIA study for the Project with validity & conditions	Environment clearance for the project is already in place and the same will be shared with the selected Concessionaire. Also, please refer Appendix-8 of the DCA.

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Sl. No.	Clause/ Reference	Queries	PPA Clarifications
10.	DCA/ Appendix 1	Please provide stockyard layout along with dimensions. Also, request to provide additional area if required. Kindly confirm whether the existing Road and railway lines need to be shifted or realigned, if required, to suit the proposed design and layout of the storage area. Please also clarify whether such modification or relocation of the road and railway Infrastructure will be considered within the project scope.	Please refer to the DPR on the broad layout of the Project Site. As regards the layout of the project facilities to be constructed including Road & Railway lines for the Terminal, please refer to the replies at Sl. 3 & 4.
11.	DCA/ Article 7.2	Request to provide power supply connection to the project site.	Power supply will be provided by PPA at one point adjacent to the Concessionaire's site on payment of applicable charges. Further reticulation within the project premises shall be the responsibility of the Concessionaire.
12.	General	Please confirm that the Right of Way for Water, Power & Conveyor will be provided by Paradip Port Authority.	The project site along with RoW for water, power & conveyor will be provided by PPA to the Concessionaire on Annual License Fee of Re.1.
13.	General	Kindly provide details on the planned access and mobilization for the project site.	Access to the project site is available. However, Bidders are also encouraged to visit the Project site to ascertain the site conditions.

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Sl. No.	Clause/ Reference	Queries	PPA Clarifications
14.	General	Please provide the following documents/studies: 1. Bathymetry Chart 2. Geotechnical studies for the Project Influence Area (berth, back up area etc.) 3. Design layouts of stockyard along with dimensions. 4. Soil Testing reports for the Project area 5. Any other relevant document/layout/drawing related to project. 6. Berth Layout	The bathymetry chart is enclosed as Annexure-I. Available bore log data is enclosed as Annexure-II. It is to mention that the soil conditions in the project site comprises of sand, silt, clay or a mixture of above and there is no rock strata. The indicative layout of the project site is given in the TEFR. The exact design layouts of various components like stackyards including construction drawings will be prepared by the selected Concessionaire as part of Detailed Engineering. Bidders are also advised to visit the Project site and ascertain the site conditions including carrying out their own surveys & investigations prior to submission of Bids.
15.	General	Kindly provide the berth design data, including all relevant parameters such as berth dimensions, design vessel particulars, loading / unloading rates, fender & mooring arrangement, deck load capacity, and any other applicable technical details, so that the topside equipment design can be properly reviewed & validated.	Please refer to Annexure-III. Also, please refer to the reply at Sl. 3 & 14.
16.	General	Kindly provide information on whether the capacity of the equipment (SCR/GSU/ Conveyor) can be modified higher than the quantity provided in the DCA as per our requirements.	Please refer to the reply at Sl. 3.
17.	General	Kindly provide information on whether a closed hood conveyor with a seal plate design can be considered in place of closed gallery.	Bidders to consider closed gallery conveyors for the purpose of submitting the bids considering the environmental & weather conditions in the project site.

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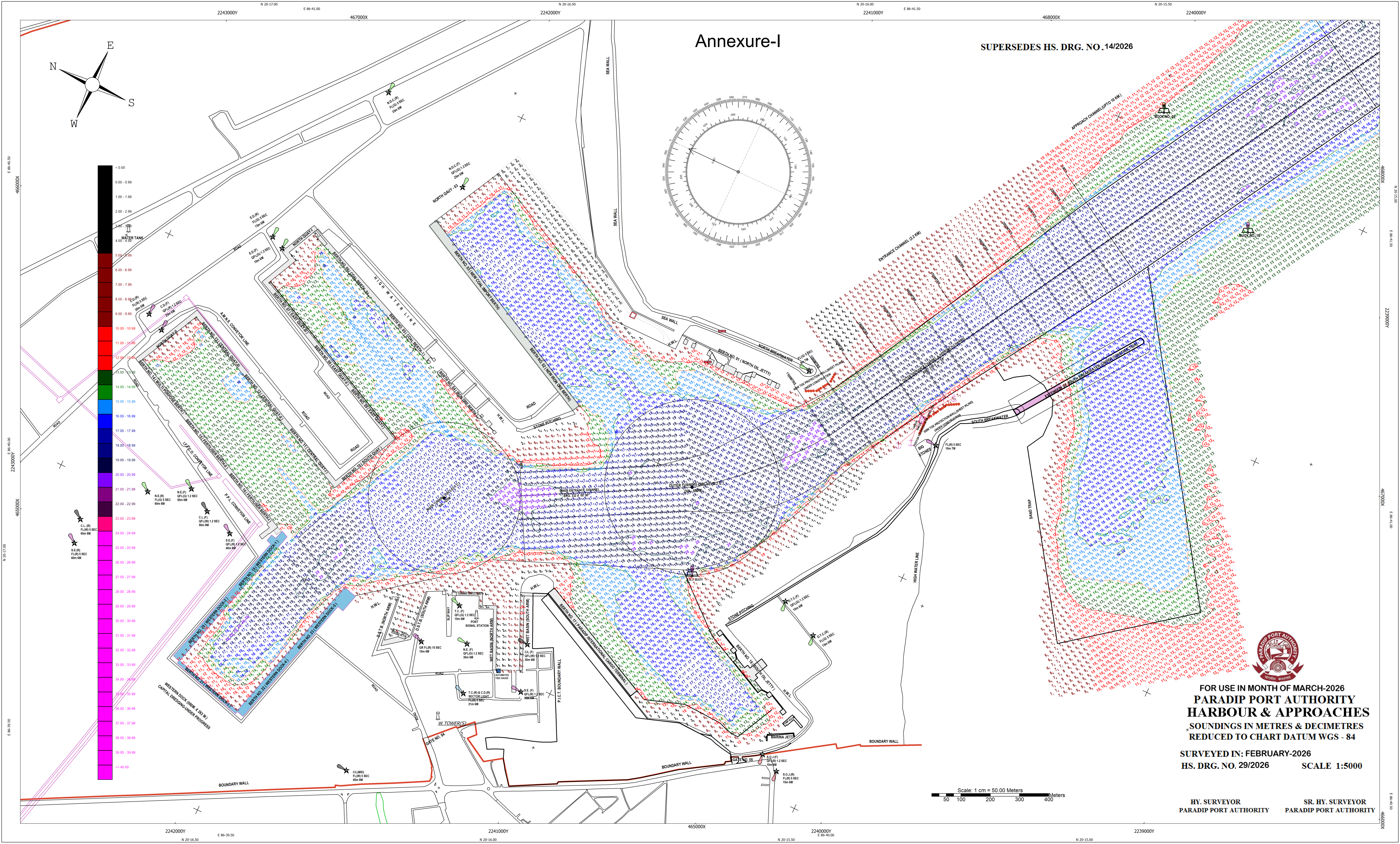
Sl. No.	Clause/ Reference	Queries	PPA Clarifications
18.	General	Kindly share health study of the existing berth or any other study which establishes that the existing berths can take load for mechanization.	The CQ-I & II Berth Condition Assessment Summary is attached as Annexure-IV. Bidders are also advised to visit the Project site and ascertain the site conditions including carrying out their own surveys & investigations prior to submission of Bids.
19.	DCA/ Appendix 4	Are bidders allowed to propose alternate configuration subject to meeting performance standards? Is providing 04 nos. of SUL is binding or Bidder may propose for Ship loader, Material Handler etc. for Export cargo?	Based on the cargo/commodity to be actually handled, the Concessionaire can design the terminal facilities, reconfigure equipment capacity/number/type and submit their proposal with supporting documents to the Independent Engineer. Such proposal may be reviewed and approved by the Independent Engineer if the terminal facilities and equipment configuration is capable of handling 18 MTPA of permitted cargo in fully mechanized manner adhering to the prescribed performance standards.
20.	DCA/ Appendix 4	Berth Condition Report: Request the authorities to share the detailed Condition Survey of the Berth structure that would be handed over to the concessionaire. Please confirm whether geotechnical data, soil investigation reports, and existing berth structural drawings will be provided to bidders.	Please refer to the reply at Sl. 18.
21.	DCA/ Appendix 4	Backup yard area of 4,00,000 sqm is indicated. Please confirm whether the entire area will be handed over free of encumbrances before construction start.	The project site will be free of encumbrances. However, rerouting of existing utilities, if any, will be done by the Concessionaire at their cost.

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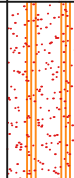
Sl. No.	Clause/ Reference	Queries	PPA Clarifications												
22.	DCA/ Appendix 4	Please confirm whether any proposed rail track layout has been approved by Indian Railways and whether the Detailed Project Report (DPR) is already available. Also, please confirm that the Authority shall facilitate and obtain all necessary clearances from concerned operators for any interface between the proposed rail tracks and the existing conveyor system, including coordination with relevant stakeholders and approvals from Indian Railways or any other statutory/ operational authority, wherever applicable.	Based on the cargo profile to be handled by the selected Concessionaire, the Concessionaire is required to undertake Detailed Engineering covering designs and preparation of construction drawings which shall also include the Railway DPR & ESP drawings. The Railway DPR & ESP drawings covering the Railway facilities, layout, Rail sidings etc. will be prepared and approval taken from the Competent Authority by the Concessionaire for execution of the Rail connectivity works.												
23.	DCA/ Appendix 14	As per DCA on it is written that “While determining the number of working days from the ship hours, the berth allowance of 8 hours shall be subtracted from the total hours.” Kindly elaborate on the 08 hours allowance.	The Gross Berth Output shall be calculated as the total cargo handled during a month divided by the time spent by ships at the terminal i.e. number of working days of ships in that month at the terminal. While determining the number of working days for each ship, berth allowance of 8 hours shall be subtracted.												
24.	DCA/ Appendix 13	MGC Clause should not be applicable during the construction period and only applicable after COD. Kindly confirm i.e. Complete waiver of provisions of MGC (Appendix 13) and Performance Standards (Appendix 14) during the construction period. <table><tr><th>Year</th><th>Minimum Guaranteed Cargo (MT)</th></tr><tr><td>1st</td><td>5.40</td></tr><tr><td>2nd</td><td>7.20</td></tr><tr><td>3rd</td><td>9.00</td></tr><tr><td>4th</td><td>10.80</td></tr><tr><td>5th year onwards</td><td>12.60</td></tr></table>	Year	Minimum Guaranteed Cargo (MT)	1st	5.40	2nd	7.20	3rd	9.00	4th	10.80	5th year onwards	12.60	The Minimum Guaranteed Cargo (MGC) shall apply from the scheduled project completion date until the expiry of Concession Period.
Year	Minimum Guaranteed Cargo (MT)														
1st	5.40														
2nd	7.20														
3rd	9.00														
4th	10.80														
5th year onwards	12.60														

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Sl. No.	Clause/ Reference	Queries	PPA Clarifications
25.	DCA/ Article 3.1	Conditions precedent requires financial close within 270 days. Please clarify whether extension will be granted if delays arise due to authority clearances.	The time of 270 days given for fulfillment of Conditions Precedent applies to both Concessionaire/ Concessioneing Authority. Any extensions may be considered as per the provisions of the Concession Agreement.
26.	General	What is the rail evacuation capacity available for the terminal?	The project is to be designed by the Concessionaire for 18 MTPA capacity. The related project facilities including Rail connectivity shall be developed by the Concessionaire to achieve the Terminal capacity of 18 MTPA. Please also refer to the reply at Sl. 4.

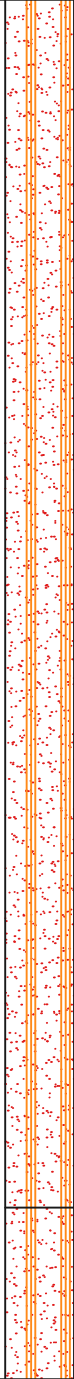


PROJECT : Geotechnical Investigation Study at Paradip Port					Annexure-II				
BORE HOLE NO. : MBH-01									
LOCATION : EQ Berth					SHEET NO. : 1 OF 4				
CO-ORDINATE : E 465778.515 N 2241904.660					DATE : 01/07/2016 to 04/07/2016				
GROUND R. L. : -14.53 m					METHOD : ROTARY DRILLING				
GROUND W. T. : MARINE BORE HOLE					CASING : 100 mm Ø Nx Upto 25.00m Below G.L.				

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
1.00	100 Ø MM		Grayish fine grained medium silty SAND	0.00	DS1								
				0.50									
2.00				1.50	SPT1	15	30	45	60	N			
				2.10		04	05	07	06	12			
3.00			3.00	DS2									
			3.50										
4.00			3.50	UDS1									
			4.10										
5.00			5.00	DS3									
			5.50										
6.00			5.50	SPT2	15	30	45	60	N				
			6.10		06	07	09	11	16				
7.00			7.00	DS4									
			7.50										
8.00			7.50	SPT3	15	30	45	60	N				
			8.10		08	12	16	20	28				
9.00	9.00	DS5											
	9.50												
10.00	9.50	SPT4	15	30	45	60	N						
	10.10		06	09	13	15	22						

SPT N =STANDARD PENETRATION TEST VALUE			RQD = ROCK QUALITY DESIGNATION			UDS = UNDISTURBED SOIL SAMPLE			SCALE : 1: 50		
CR = CORE RECOVERY			DS = DISTURBED SOIL SAMPLE			VST = VANE SHEAR TEST			JOB NO. : 172		

PROJECT : Geotechnical Investigation Study at Paradip Port			
BORE HOLE NO. : MBH-01			
LOCATION : EQ Berth		SHEET NO. : 2 OF 4	
CO-ORDINATE : E 465778.515 N 2241904.660		DATE : 01/07/2016 to 04/07/2016	
GROUND R. L. : -14.53 m		METHOD : ROTARY DRILLING	
GROUND W. T. : MARINE BORE HOLE		CASING : 100 mm Ø Nx Upto 25.00m Below G.L.	

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
11.00	100 Ø MM		Yellowish fine grained dense silty SAND	11.00	DS6								
				11.50									
				11.50	SPT5	15	30	45	60	N			
				12.10		10	15	17	20	32			
12.00													
				13.00	DS7								
				13.50									
				13.50	SPT6	15	30	45	60	N			
				14.10		09	14	18	21	32			
14.00													
				15.00	DS8								
				15.50									
				15.50	SPT7	15	30	45	60	N			
				16.10		11	14	17	20	31			
16.00													
				17.00	DS9								
				17.50									
				17.50	SPT8	15	30	45	60	N			
				18.10		09	13	14	23	32			
18.00													
				19.00	DS10								
				19.50									
			Yellowish fine grained medium silty SAND	19.50									
				20.10	SPT9	15	30	45	60	N			
						08	11	14	17	25			
20.00													

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CR = CORE RECOVERY

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UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-01	
LOCATION : EQ Berth	SHEET NO. : 3 OF 4
CO-ORDINATE : E 465778.515 N 2241904.660	DATE : 01/07/2016 to 04/07/2016
GROUND R. L. : -14.53 m	METHOD : ROTARY DRILLING
GROUND W. T. : MARINE BORE HOLE	CASING : 100 mm Ø Nx Upto 25.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
21.00	100 Ø MM		Yellowish fine grained dense silty SAND	21.00	DS11								
				21.50									
				21.50	SPT10	15	30	45	60	N			
				22.10		10	12	18	29	30			
22.00													
				23.00	DS12								
				23.50									
				23.50	SPT11	15	30	45	60	N			
				24.10		13	17	21	24	38			
24.00													
			Yellowish fine grained medium silty SAND	25.00	DS13								
				25.50									
				25.50	SPT12	15	30	45	60	N			
				26.10		09	11	13	14	24			
26.00													
				27.00	DS14								
				27.50									
				27.50	SPT13	15	30	45	60	N			
				28.10		07	10	13	18	23			
28.00													
				29.00	DS15								
				29.50									
				29.50	SPT14	15	30	45	60	N			
				30.10		06	08	11	14	19			
30.00													

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VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-01	
LOCATION : EQ Berth	SHEET NO. : 4 OF 4
CO-ORDINATE : E 465778.515 N 2241904.660	DATE : 01/07/2016 to 04/07/2016
GROUND R. L. : -14.53 m	METHOD : ROTARY DRILLING
GROUND W. T. : MARINE BORE HOLE	CASING : 100 mm Ø Nx Upto 25.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
31.00	100 Ø MM		Yellowish fine grained dense silty SAND	31.00	DS16								
				31.50									
				31.50	SPT15	15	30	45	60	N			
				32.10		11	14	18	23	32			
32.00													
				33.00	DS17								
				33.50									
			Yellowish fine grained medium silty SAND	33.50	SPT16	15	30	45	60	N			
				34.10		08	11	13	16	24			
34.00													
				35.00	DS18								
				35.50									
				35.50	SPT17	15	30	45	60	N			
				36.10		08	10	13	15	23			
36.00													
				37.00	DS18								
				37.50									
				37.50	SPT18	15	30	45	60	N			
				38.10		07	10	13	15	23			
38.00													
				39.00	DS20								
				39.50									
				39.50	SPT19	15	30	45	60	N			
				40.10		08	10	13	15	23			
40.00													

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DS = DISTURBED SOIL SAMPLE

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SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port			
BORE HOLE NO. : MBH-03			
LOCATION : EQ Berth		SHEET NO. : 1 OF 5	
CO-ORDINATE : E 465853.522 N 2242057.217		DATE : 26/06/2016 to 29/06/2016	
GROUND R. L. : -12.907 m		METHOD : ROTARY DRILLING	
GROUND W. T. : MARINE BORE HOLE		CASING : 100 mm Ø Nx Upto 30.00m Below G.L.	

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
1.00	100 Ø MM		Grayish stiff silty CLAY	0.00	DS1								
				0.50									
				1.50		SPT1	15	30	45	60	N		
2.10				03	05		07	07	12				
3.00				DS2									
3.50													
3.50					UDS1								
4.00													
5.00					Grayish fine grained medium silty SAND	5.00	DS3						
5.50													
5.50		SPT2	15			30	45	60	N				
6.10			08			10	12	20	27				
7.00	DS4	7.00											
7.50													
7.50	SPT3	15	30			45	60	N					
8.10		07	13			20	21	33					
9.00		Grayish fine grained dense silty SAND	9.00			DS5							
9.50													
9.50			SPT4	15	30	45	60	N					
10.10				10	12	19	23	31					
10.00													

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SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-03	
LOCATION : EQ Berth	SHEET NO. : 2 OF 5
CO-ORDINATE : E 465853.522 N 2242057.217	DATE : 26/06/2016 to 29/06/2016
GROUND R. L. : -12.907 m	METHOD : ROTARY DRILLING
GROUND W. T. : MARINE BORE HOLE	CASING : 100 mm Ø Nx Upto 30.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
11.00	100 Ø MM		Grayish fine grained dense silty SAND	11.00	DS6								
				11.50									
				11.50	SPT5	15	30	45	60	N			
				12.10		09	14	16	20	30			
12.00													
				13.00	DS7								
				13.50									
				13.50	SPT6	15	30	45	60	N			
				14.10		14	20	24	31	44			
14.00													
				15.00	DS8								
				15.50									
			Yellowish fine grained very dense silty SAND	15.50	SPT7	15	30	45	60	N			
				16.10		16	22	28	36	50			
16.00													
				17.00	DS9								
				17.50									
				17.50	SPT8	15	30	45	60	N			
				18.10		17	20	25	31	45			
18.00													
				19.00	DS10								
				19.50									
				19.50	SPT9	15	30	45	60	N			
				20.10		15	25	30	35	55			
20.00													

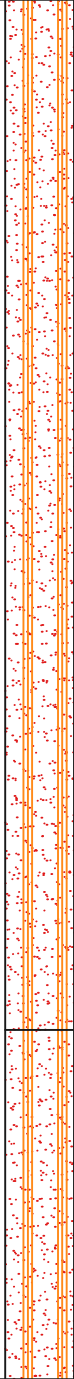
SPT N =STANDARD PENETRATION TEST VALUE
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PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-03	
LOCATION : EQ Berth	SHEET NO. : 3 OF 5
CO-ORDINATE : E 465853.522 N 2242057.217	DATE : 26/06/2016 to 29/06/2016
GROUND R. L. : -12.907 m	METHOD : ROTARY DRILLING
GROUND W. T. : MARINE BORE HOLE	CASING : 100 mm Ø Nx Upto 30.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
21.00	100 Ø MM		Grayish fine grained dense silty SAND	21.00	DS11								
				21.50									
				21.50	SPT10	15	30	45	60	N			
				22.10		12	18	20	26	38			
22.00													
				23.00	DS12								
				23.50									
				23.50	SPT11	15	30	45	60	N			
				24.10		08	15	19	20	33			
24.00													
				25.00	DS13								
				25.50									
				25.50	SPT12	15	30	45	60	N			
				26.10		07	14	18	20	32			
26.00													
				27.00	DS14								
				27.50									
				27.50	SPT13	15	30	45	60	N			
				28.10		09	15	19	22	34			
28.00			Grayish fine grained medium silty SAND										
				29.00	DS15								
				29.50									
				29.50	SPT14	15	30	45	60	N			
				30.10		08	08	12	28	20			
30.00													

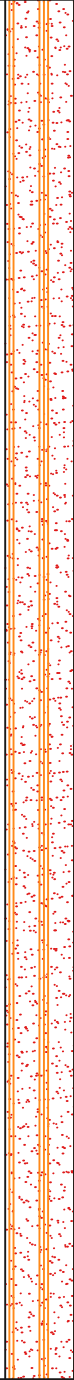
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-03	
LOCATION : EQ Berth	SHEET NO. : 4 OF 5
CO-ORDINATE : E 465853.522 N 2242057.217	DATE : 26/06/2016 to 29/06/2016
GROUND R. L. : -12.907 m	METHOD : ROTARY DRILLING
GROUND W. T. : MARINE BORE HOLE	CASING : 100 mm Ø Nx Upto 30.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
31.00	100 Ø MM		Grayish fine grained medium silty SAND	31.00	DS16								
				31.50									
				31.50	SPT15	15	30	45	60	N			
				32.10		08	10	14	16	24			
32.00													
				33.00	DS17								
				33.50									
				33.50	SPT16	15	30	45	60	N			
				34.10		07	09	12	24	21			
34.00													
				35.00	DS18								
				35.50									
				35.50	SPT17	15	30	45	60	N			
				36.10		09	14	18	19	32			
36.00													
				37.00	DS19								
				37.50									
				37.50	SPT18	15	30	45	60	N			
				38.10		08	12	13	16	25			
38.00													
				39.00	DS20								
				39.50									
				39.50	SPT19	15	30	45	60	N			
				40.10		07	11	15	17	26			
40.00													

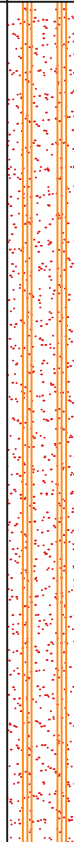
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

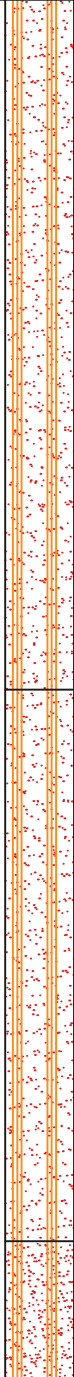
SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-03	
LOCATION : EQ Berth	SHEET NO. : 5 OF 5
CO-ORDINATE : E 465853.522 N 2242057.217	DATE : 26/06/2016 to 29/06/2016
GROUND R. L. : -12.907 m	METHOD : ROTARY DRILLING
GROUND W. T. : MARINE BORE HOLE	CASING : 100 mm Ø Nx Upto 30.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS																				
				DEPTH (m)	TYPE	15	15	15	15																								
41.00	100 Ø MM		Grayish fine grained medium silty SAND	41.00	DS21	15 06	30 11	45 13	60 17	N 24																							
				41.50																													
				41.50	SPT20																												
				42.10																													
42.00																																	
43.00																																	
44.00																																	
45.00																																	
46.00																																	
47.00																																	
48.00																																	
49.00																																	
40.00																																	

SPT N =STANDARD PENETRATION TEST VALUE	RQD = ROCK QUALITY DESIGNATION	UDS = UNDISTURBED SOIL SAMPLE	SCALE : 1: 50 JOB NO. : 172
CR = CORE RECOVERY	DS = DISTURBED SOIL SAMPLE	VST = VANE SHEAR TEST	

PROJECT : Geotechnical Investigation Study at Paradip Port			
BORE HOLE NO. : MBH-04			
LOCATION : EQ Berth		SHEET NO. : 1 OF 4	
CO-ORDINATE : E 465891.058 N 2242133.480		DATE : 05/07/2016 to 08/07/2016	
GROUND R. L. : -12.67 m		METHOD : ROTARY DRILLING	
GROUND W. T. : MARINE BORE HOLE		CASING : 100 mm Ø Nx Upto 30.00m Below G.L.	

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
1.00	100 Ø MM		Yellowish fine grained loose silty SAND	0.00	DS1								
				0.50									
2.00				1.50	SPT1	15	30	45	60	N			
				2.10		02	03	03	05	06			
3.00				3.00	DS2								
				3.50									
4.00			Yellowish fine grained medium silty SAND	3.50	SPT2	15	30	45	60	N			
				4.10		02	04	05	08	09			
5.00				5.00	DS3								
				5.50									
6.00				5.50	SPT3	15	30	45	60	N			
				6.10		06	08	11	13	19			
7.00			Yellowish fine grained dense silty SAND	7.00	DS4								
				7.50									
8.00				7.50	SPT4	15	30	45	60	N			
				8.10		09	10	13	15	23			
9.00			Yellowish fine grained dense silty SAND	9.00	DS5								
				9.50									
10.00				9.50	SPT5	15	30	45	60	N			
				10.10		10	14	17	23	31			

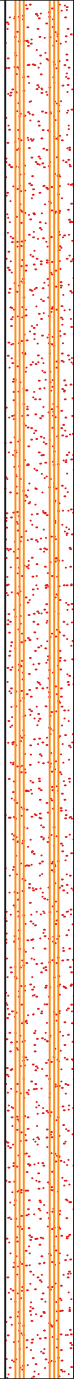
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-04	
LOCATION : EQ Berth	SHEET NO. : 2 OF 4
CO-ORDINATE : E 465891.058 N 2242133.480	DATE : 05/07/2016 to 08/07/2016
GROUND R. L. : -12.67 m	METHOD : ROTARY DRILLING
GROUND W. T. : MARINE BORE HOLE	CASING : 100 mm Ø Nx Upto 30.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
11.00	100 Ø MM		Grayish fine grained dense silty SAND	11.00	DS6								
				11.50									
				11.50	SPT6	15	30	45	60	N			
				12.10		12	16	18	23	34			
12.00													
13.00													
				13.00	DS7								
				13.50									
				13.50	SPT7	15	30	45	60	N			
				14.10		13	16	21	26	37			
14.00													
15.00													
				15.00	DS8								
				15.50									
				15.50	SPT8	15	30	45	60	N			
				16.10		14	17	21	28	38			
16.00													
17.00													
				17.00	DS9								
				17.50									
				17.50	SPT9	15	30	45	60	N			
				18.10		14	18	23	29	41			
18.00													
19.00													
				19.00	DS10								
				19.50									
				19.50	SPT10	15	30	45	60	N			
				20.10		14	19	26	34	45			
20.00													

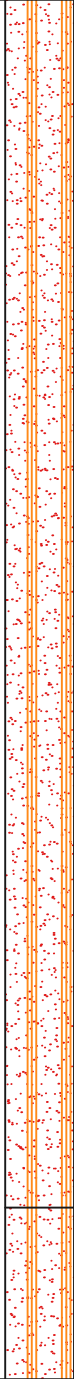
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-04	
LOCATION : EQ Berth	SHEET NO. : 3 OF 4
CO-ORDINATE : E 465891.058 N 2242133.480	DATE : 05/07/2016 to 08/07/2016
GROUND R. L. : -12.67 m	METHOD : ROTARY DRILLING
GROUND W. T. : MARINE BORE HOLE	CASING : 100 mm Ø Nx Upto 30.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
21.00	100 Ø MM		Grayish fine grained dense silty SAND	21.00	DS11								
				21.50									
				21.50	SPT11	15	30	45	60	N			
				22.10		16	22	26	33	48			
22.00													
				23.00	DS12								
				23.50									
				23.50	SPT12	15	30	45	60	N			
				24.10		16	20	26	34	46			
24.00													
				25.00	DS13								
				25.50									
				25.50	SPT13	15	30	45	60	N			
				26.10		18	23	25	36	48			
26.00													
				27.00	DS14								
				27.50									
				27.50	SPT14	15	30	45	60	N			
				28.10		08	13	18	24	31			
28.00													
			Grayish fine grained medium silty SAND	29.00	DS15								
				29.50									
				29.50	SPT15	15	30	45	60	N			
				30.10		08	13	15	21	28			
30.00													

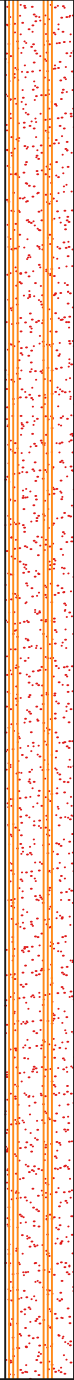
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-04	
LOCATION : EQ Berth	SHEET NO. : 4 OF 4
CO-ORDINATE : E 465891.058 N 2242133.480	DATE : 05/07/2016 to 08/07/2016
GROUND R. L. : -12.67 m	METHOD : ROTARY DRILLING
GROUND W. T. : MARINE BORE HOLE	CASING : 100 mm Ø Nx Upto 30.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
31.00	100 Ø MM		Grayish fine grained medium silty SAND	31.00	DS16								
				31.50									
				31.50	SPT16	15	30	45	60	N			
				32.10		03	11	16	30	27			
32.00													
				33.00	DS17								
				33.50									
				33.50	SPT17	15	30	45	60	N			
				34.10		09	13	16	21	29			
34.00													
				35.00	DS18								
				35.50									
				35.50	SPT18	15	30	45	60	N			
				36.10		11	14	16	20	30			
36.00													
				37.00	DS19								
				37.50									
				37.50	SPT19	15	30	45	60	N			
				38.10		10	10	14	21	24			
38.00													
				39.00	DS20								
				39.50									
				39.50	SPT20	15	30	45	60	N			
				40.10		10	12	14	24	26			
40.00													

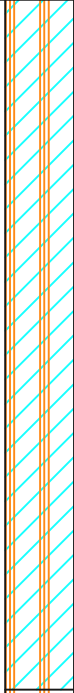
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port			
BORE HOLE NO. : MBH-05			
LOCATION : EQ Berth		SHEET NO. : 1 OF 4	
CO-ORDINATE : E 465928.584 N 2242209.748		DATE : 10/07/2016 to 12/07/2016	
GROUND R. L. : -12.84 m		METHOD : ROTARY DRILLING	
GROUND W. T. : Marine Bore Hole m.BGL		CASING : 100 mm Ø Nx Upto 35.00m Below G.L.	

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
1.00	100 Ø MM		Yellowish stiff silty CLAY	0.00	DS1								
				0.50									
				1.50	SPT1	15	30	45	60	N			
2.00				2.10		02	02	03	05	05			
3.00				3.00	DS2								
				3.50									
4.00			Yellowish fine grained medium silty SAND	3.50	UDS1								
				4.00									
5.00				5.00	DS3								
				5.50									
6.00				5.50	SPT3	15	30	45	60	N			
				6.10		06	09	11	15	20			
7.00				7.00	DS4								
				7.50									
8.00				7.50	SPT3	15	30	45	60	N			
				8.10		09	12	16	21	28			
9.00				9.00	DS5								
				9.50									
10.00				9.50	SPT4	15	30	45	60	N			
				10.10		10	13	18	24	31			

SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-05	
LOCATION : EQ Berth	SHEET NO. : 2 OF 4
CO-ORDINATE : E 465928.584 N 2242209.748	DATE : 10/07/2016 to 12/07/2016
GROUND R. L. : -12.84 m	METHOD : ROTARY DRILLING
GROUND W. T. : Marine Bore Hole m.BGL	CASING : 100 mm Ø Nx Upto 35.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
11.00	100 Ø MM		Yellowish fine grained dense silty SAND	11.00	DS6								
				11.50									
				11.50	SPT5	15	30	45	60	N			
				12.10		11	14	18	23	32			
12.00													
				13.00	DS7								
				13.50									
				13.50	SPT6	15	30	45	60	N			
				14.10		12	16	19	22	35			
14.00													
				15.00	DS8								
				15.50									
				15.50	SPT7	15	30	45	60	N			
				16.10		13	17	20	26	37			
16.00													
				17.00	DS9								
				17.50									
				17.50	SPT9	15	30	45	60	N			
				18.10		15	18	22	27	40			
18.00													
				19.00	DS10								
				19.50									
				19.50	SPT10	15	30	45	60	N			
				20.10		15	22	26	32	48			
20.00													

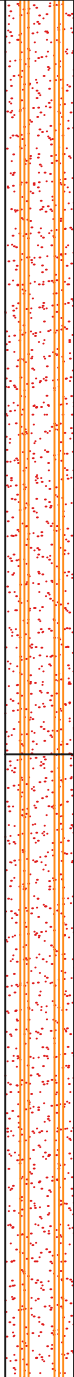
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-05	
LOCATION : EQ Berth	SHEET NO. : 3 OF 4
CO-ORDINATE : E 465928.584 N 2242209.748	DATE : 10/07/2016 to 12/07/2016
GROUND R. L. : -12.84 m	METHOD : ROTARY DRILLING
GROUND W. T. : Marine Bore Hole m.BGL	CASING : 100 mm Ø Nx Upto 35.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
21.00	100 Ø MM		Yellowish fine grained very dense silty SAND	21.00	DS11								
				21.50									
				21.50	SPT10	15	30	45	60	N			
				22.10		16	24	26	33	50			
22.00													
				23.00	DS12								
				23.50									
				23.50	SPT11	15	30	45	60	N			
				24.10		17	25	28	34	52			
24.00													
				25.00	DS13								
				25.50									
				25.50	SPT12	15	30	45	60	N			
				26.10		08	12	14	20	26			
26.00			Yellowish fine grained dense silty SAND										
				27.00	DS14								
				27.50									
				27.50	SPT13	15	30	45	60	N			
				28.10		09	13	19	22	32			
28.00													
				29.00	DS15								
				29.50									
				29.50	SPT14	15	30	45	60	N			
				30.10		10	14	19	24	33			
30.00													

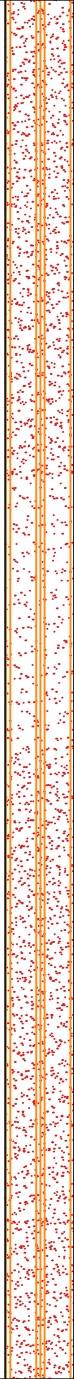
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-05	
LOCATION : EQ Berth	SHEET NO. : 4 OF 4
CO-ORDINATE : E 465928.584 N 2242209.748	DATE : 10/07/2016 to 12/07/2016
GROUND R. L. : -12.84 m	METHOD : ROTARY DRILLING
GROUND W. T. : Marine Bore Hole m.BGL	CASING : 100 mm Ø Nx Upto 35.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
31.00	100 Ø MM		Yellowish fine grained dense silty SAND	31.00	DS16								
				31.50									
				31.50	SPT15	15	30	45	60	N			
				32.10		09	13	19	24	32			
32.00													
				33.00	DS17								
				33.50									
				33.50	SPT16	15	30	45	60	N			
				34.10		10	14	19	27	33			
34.00													
				35.00	DS18								
				35.50									
				35.50	SPT17	15	30	45	60	N			
				36.10		11	16	19	27	35			
36.00													
				37.00	DS19								
				37.50									
				37.50	SPT18	15	30	45	60	N			
				38.10		12	17	21	26	38			
38.00													
				39.00	DS20								
				39.50									
				39.50	SPT19	15	30	45	60	N			
				40.10		13	19	21	24	40			
40.00													

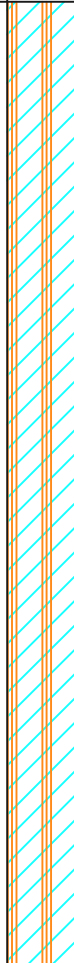
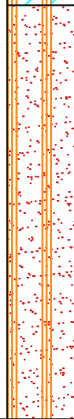
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

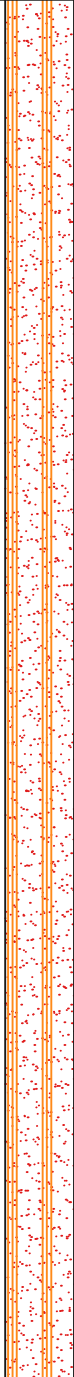
SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-07	
LOCATION : EQ Berth	SHEET NO. : 1 OF 4
CO-ORDINATE : E 466003.635 N 2242362.285	DATE : 13/07/2016 to 14/07/2016
GROUND R. L. : -12.38 m	METHOD : ROTARY DRILLING
GROUND W. T. : Marine Bore Hole m.BGL	CASING : 100 mm Ø Nx Upto 36.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS	
				DEPTH (m)	TYPE	15	15	15	15					
1.00	100 Ø MM		Yellowish stiff silty CLAY	0.00	DS1									
				0.50										
				1.50	SPT1	15	30	45	60	N 05				
				2.10		02	02	03	05					
2.00														
				3.00	DS2									
				3.50										
				3.50	UDS1									
				4.10										
4.00														
				5.00	DS3									
				5.50										
				5.50	SPT2	15	30	45	60	N 08				
				6.10		02	03	05	07					
6.00														
7.00				7.00	DS4									
				7.50										
				7.50	SPT3	15	30	45	60	N 13				
				8.10		03	05	08	13					
8.00			Yellowish fine grained medium silty SAND											
						9.00	DS5							
9.00						9.50								
						9.50	SPT4	15	30	45	60	N 23		
						10.10		06	11	18	21			
10.00														

SPT N =STANDARD PENETRATION TEST VALUE	RQD = ROCK QUALITY DESIGNATION	UDS = UNDISTURBED SOIL SAMPLE	SCALE : 1: 50 JOB NO. : 172
CR = CORE RECOVERY	DS = DISTURBED SOIL SAMPLE	VST = VANE SHEAR TEST	

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-07	
LOCATION : EQ Berth	SHEET NO. : 2 OF 4
CO-ORDINATE : E 466003.635 N 2242362.285	DATE : 13/07/2016 to 14/07/2016
GROUND R. L. : -12.38 m	METHOD : ROTARY DRILLING
GROUND W. T. : Marine Bore Hole m.BGL	CASING : 100 mm Ø Nx Upto 36.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
11.00	100 Ø MM		Yellowish fine grained dense silty SAND	11.00	DS6								
				11.50									
				11.50	SPT5	15	30	45	60	N			
				12.10		07	12	19	22	31			
12.00													
				13.00	DS7								
				13.50									
				13.50	SPT6	15	30	45	60	N			
				14.10		08	13	21	23	34			
14.00													
				15.00	DS8								
				15.50									
				15.50	SPT7	15	30	45	60	N			
				16.10		09	13	21	23	36			
16.00													
				17.00	DS9								
				17.50									
				17.50	SPT8	15	30	45	60	N			
				18.10		10	14	24	26	38			
18.00													
				19.00	DS10								
				19.50									
				19.50	SPT9	15	30	45	60	N			
				20.10		11	18	21	26	39			
20.00													

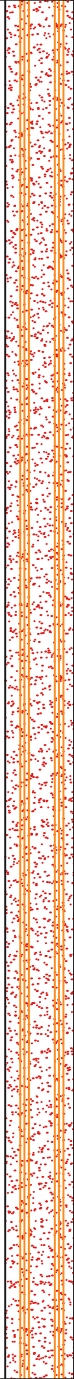
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-07	
LOCATION : EQ Berth	SHEET NO. : 3 OF 4
CO-ORDINATE : E 466003.635 N 2242362.285	DATE : 13/07/2016 to 14/07/2016
GROUND R. L. : -12.38 m	METHOD : ROTARY DRILLING
GROUND W. T. : Marine Bore Hole m.BGL	CASING : 100 mm Ø Nx Upto 36.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
21.00	100 Ø MM		Yellowish fine grained medium silty SAND	21.00	DS11								
				21.50									
				21.50	SPT10	15	30	45	60	N			
				22.10		08	09	11	13	21			
22.00													
				23.00	DS12								
				23.50									
				23.50	SPT11	15	30	45	60	N			
				24.10		09	10	13	15	23			
24.00													
				25.00	DS13								
				25.50									
				25.50	SPT12	15	30	45	60	N			
				26.10		07	10	14	18	24			
26.00													
				27.00	DS14								
				27.50									
				27.50	SPT13	15	30	45	60	N			
				28.10		08	11	14	18	25			
28.00													
				29.00	DS15								
				29.50									
				29.50	SPT14	15	30	45	60	N			
				30.00		08	12	12	15	24			
30.00													

SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-07	
LOCATION : EQ Berth	SHEET NO. : 4 OF 4
CO-ORDINATE : E 466003.635 N 2242362.285	DATE : 13/07/2016 to 14/07/2016
GROUND R. L. : -12.38 m	METHOD : ROTARY DRILLING
GROUND W. T. : Marine Bore Hole m.BGL	CASING : 100 mm Ø Nx Upto 36.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
31.00	100 Ø MM		Yellowish fine grained medium silty SAND	31.00	DS16								
				31.50									
				31.50	SPT15	15	30	45	60	N			
				32.10		09	12	14	19	26			
32.00													
				33.00	DS17								
				33.50									
33.00			Yellowish fine grained dense silty SAND	33.50	SPT16	15	30	45	60	N			
				34.10		08	13	15	21	28			
34.00													
				35.00	DS18								
				35.50									
35.00				35.50	SPT17	15	30	45	60	N			
				36.10		10	15	18	24	31			
36.00													
				37.00	DS19								
				37.50									
37.00				37.00	SPT18	15	30	45	60	N			
				38.10		12	16	17	28	33			
38.00													
				39.00	DS20								
				39.50									
39.00				39.00	SPT19	15	30	45	60	N			
				39.50		12	17	18	29	35			
40.00													

SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port			
BORE HOLE NO. : MBH-08			
LOCATION : EQ Berth		SHEET NO. : 1 OF 4	
CO-ORDINATE : E 466041.161 N 2242438.553		DATE : 23/06/2016 to 25/06/2016	
GROUND R. L. : -5.673 m		METHOD : ROTARY DRILLING	
GROUND W. T. : Marine Bore Hole m.BGL		CASING : 100 mm Ø Nx Upto 20.00m Below G.L.	

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
1.00	100 Ø MM		Grayish fine grained dense silty SAND	0.00	DS1								
				0.50									
				1.50	SPT1	15	30	45	60	N			
2.00						05	14	14	21	28			
				3.00	DS2								
				3.50									
				3.50	SPT2	15	30	45	60	N			
4.00						10	16	19	20	35			
				5.00	DS3								
				5.50									
				5.50	SPT3	15	30	45	60	N			
6.00						09	15	17	17	32			
				7.00	DS4								
				7.50									
				7.50	SPT4	15	30	45	60	N			
8.00						08	13	20	21	33			
				9.00	DS5								
				9.50									
				9.50	SPT5	15	30	45	60	N			
10.00						09	16	21	24	37			

SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port			
BORE HOLE NO. : MBH-08			
LOCATION : EQ Berth		SHEET NO. : 2 OF 4	
CO-ORDINATE : E 466041.161 N 2242438.553		DATE : 23/06/2016 to 25/06/2016	
GROUND R. L. : -5.673 m		METHOD : ROTARY DRILLING	
GROUND W. T. : Marine Bore Hole m.BGL		CASING : 100 mm Ø Nx Upto 20.00m Below G.L.	

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
11.00	100 Ø MM		Grayish fine grained dense silty SAND	11.00	DS6								
				11.50									
				11.50	SPT6	15	30	45	60	N			
				12.10		10	20	20	32	40			
12.00													
13.00				13.00	DS7								
				13.50									
			Yellowish fine grained very dense silty SAND	13.50	SPT7	15	30	45	60	N			
				14.10		17	25	27	36	52			
14.00													
15.00				15.00	DS8								
				15.50									
				15.50	SPT8	15	30	45	60	N			
				16.10		16	20	30	46	50			
16.00													
17.00				17.00	DS9								
				17.50									
				17.50	SPT9	15	30	45	60	N			
				18.10		18	24	28	29	52			
18.00													
19.00				19.00	DS10								
				19.50									
				19.50	SPT10	15	30	45	60	N			
				20.10		10	25	30	30	55			
20.00													

SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-08	
LOCATION : EQ Berth	SHEET NO. : 3 OF 4
CO-ORDINATE : E 466041.161 N 2242438.553	DATE : 23/06/2016 to 25/06/2016
GROUND R. L. : -5.673 m	METHOD : ROTARY DRILLING
GROUND W. T. : Marine Bore Hole m.BGL	CASING : 100 mm Ø Nx Upto 20.00m Below G.L.

DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
21.00	100 Ø MM		Yellowish fine grained very dense silty SAND	21.00	DS11								
				21.50									
				21.50	SPT11	15	30	45	60	N			
				22.10		20	30	36	42	66			
22.00													
				23.00	DS12								
				23.50									
				23.50	SPT12	15	30	45	60	N			
				24.10		18	26	30	36	56			
24.00													
				25.00	DS13								
				25.50									
				25.50	SPT13	15	30	45	60	N			
				26.10		15	20	26	30	46			
26.00			Yellowish fine grained medium silty SAND										
				27.00	DS14								
				27.50									
				27.50	SPT14	15	30	45	60	N			
				28.10		06	08	10	10	18			
28.00													
				29.00	DS15								
				29.50									
				29.50	UDS1								
				30.00									
30.00													

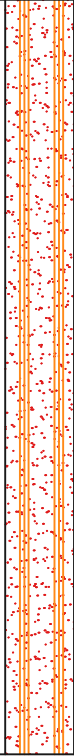
SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172

PROJECT : Geotechnical Investigation Study at Paradip Port	
BORE HOLE NO. : MBH-08	
LOCATION : EQ Berth	SHEET NO. : 4 OF 4
CO-ORDINATE : E 466041.161 N 2242438.553	DATE : 23/06/2016 to 25/06/2016
GROUND R. L. : -5.673 m	METHOD : ROTARY DRILLING
GROUND W. T. : Marine Bore Hole m.BGL	CASING : 100 mm Ø Nx Upto 20.00m Below G.L.

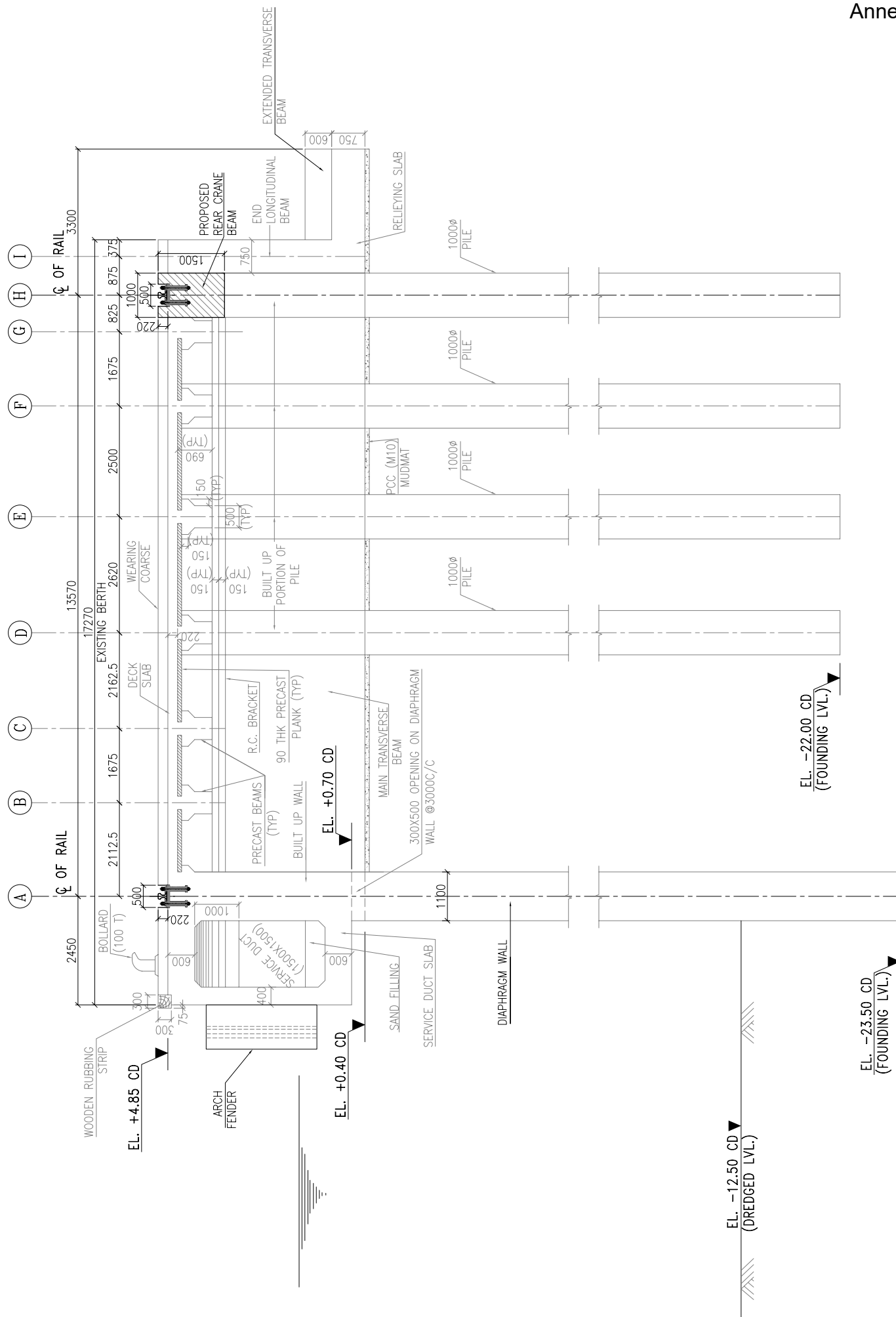
DEPTH (m.)	DIA. OF BORE HOLE	LOG.	STRATA DESCRIPTION	SAMPLE		BLOWS/15cm				SPT N	C R %	RQD %	OTHER TESTS
				DEPTH (m)	TYPE	15	15	15	15				
31.00	100 Ø MM		Grayish fine grained medium silty SAND	31.00	DS16								
				31.50									
				31.50	SPT15	15	30	45	60	N			
				32.10		08	10	12	10	22			
32.00													
				33.00	DS17								
				33.50									
				33.50	SPT16	15	30	45	60	N			
				34.10		06	09	11	13	20			
34.00													
				35.00	DS18								
				35.50									
				35.50	SPT17	15	30	45	60	N			
				36.10		09	11	14	14	25			
36.00													
37.00													
38.00													
39.00													
40.00													

SPT N =STANDARD PENETRATION TEST VALUE
CR = CORE RECOVERY

RQD = ROCK QUALITY DESIGNATION
DS = DISTURBED SOIL SAMPLE

UDS = UNDISTURBED SOIL SAMPLE
VST = VANE SHEAR TEST

SCALE : 1: 50
JOB NO. : 172



SECTION - 'A-A',

SUMMARY OF HEALTH CONDITION OF CENTRAL QUAY-I (CQ-I) BERTH

The Condition Assessment of concrete of the RC Diaphragm walls of the CQ-I were carried out above water level through various investigations including visual inspection, rebound hammer, ultrasonic pulse velocity, half-cell potential test, carbonation test, core test, concrete powder sampling for chlorides and pH to find the existing condition of the structure depending on the accessibility.

Based on the results of the Non-Destructive Tests carried out on the RC Diaphragm wall of CQ-I at Paradip Port, Odisha, the following conclusions are drawn:

- The average Rebound hammer values in the RC Diaphragm wall vary from 41 to 47, indicating that the quality of concrete in the near surface above the water level is “Very Good”.
- The average UPV values in the RC Diaphragm wall in CQ-I berth are above 3.5 km/s and the integrity of concrete can be considered as ‘Good’ as per the guidelines of IS: 13311 (Part I)- 1992.
- It is to be noted that the UPV tests were conducted in the locations of the RC Diaphragm wall which appeared good on visual inspection and it is found that the core/interior of the concrete is also in a good condition.
- The concrete core samples extracted from the RC Diaphragm wall did not exhibit carbonation.
- The average equivalent cube compressive strength of the core samples extracted from the RC Diaphragm wall is 37.1 MPa. This value exceeds the target mean strength of M20 grade concrete which is the minimum concrete grade for design mix for RCC members as per IS 456-2000. However, the current IS code 4651(Part-4) for Port and Harbour structures prescribes concrete grade not less than M35 for RCC but this was not at the time of construction
- The half-cell potentials in the visually good locations and moderate location of the RC Diaphragm wall are between -200 mV to -350 mV indicating that the corrosion activity of the reinforcing steel in the area is uncertain at the time of measurement as per the reference guidelines of ASTM C-876.
- The half-cell potentials in portions of Diaphragm wall, which showed signs of visual distress of the RC Diaphragm wall are above -350 mV indicating that there is a greater than 90 % probability that reinforcing steel corrosion is occurring in that area at the time of measurement as per the reference guidelines of ASTM C-876.

- The chloride contents drawn from the selected locations of the RC Diaphragm wall of the CQ-I are between 1.12 kg/m³ and 4.31 kg/m³ compared to a permissible value of 0.6 kg/m³ at the time of placing as specified in IS: 456-2000. In view of the prevailing Marine environment, the chloride levels are on the higher side and hence the CQ-I may be frequently inspected to check for possible distress/corrosion of the steel rebar and timely repair wherever required.
- The pH of the concrete samples in the RC Diaphragm wall varies from 10.70 and 11.81, which indicates availability of alkalinity. Though is lower than the pH value of 13 for fresh concrete, corrosion of steel will be significant only if pH value falls below 7 and hence this parameter value indicates the concrete in good condition and will protect the steel reinforcement inside it.
- It recommended that the minor distresses noticed in the RC Diaphragm wall on the berthing face above water level may be rehabilitated using Polymer modified mortar.

SUMMARY OF HEALTH CONDITION OF CENTRAL QUAY-II (CQ-II) BERTH

The Condition Assessment of concrete of the RC Diaphragm walls of the CQ-II was carried out above water level through various investigations including visual inspection, rebound hammer, ultrasonic pulse velocity, half-cell potential test, carbonation test, core test, concrete powder sampling for chlorides and pH levels to find the existing condition of the structure depending on the accessibility.

Based on the results of the Non-Destructive Tests carried out on the RC Diaphragm wall of CQ-II berth at Paradip Port, Odisha, the following conclusions are drawn:

- The average Rebound hammer values in the RC Diaphragm wall vary from 43 to 47, indicating that the quality of concrete in the near surface above the water level is “Very Good”.
- The average UPV values in the RC Diaphragm wall in CQ-II berth are above 3.5 km/s and the integrity of concrete can be considered as ‘Good’ as per the guidelines of IS: 13311 (Part I)- 1992.
- It is to be noted that the UPV tests were conducted in the locations of the RC Diaphragm wall which appeared good on visual inspection and it is found that the core/interior of the concrete is also in a good condition.

- The concrete core samples extracted from the RC Diaphragm wall did not exhibit carbonation.
- The average equivalent cube compressive strength of the core samples extracted from the RC Diaphragm wall is 31.2 MPa. This value exceeds the target mean strength of M20 grade concrete which is the minimum concrete grade for design mix for RCC members as per IS 456-2000. However, the current IS code 4651(Part-4) for Port and Harbour structures prescribes concrete grade not less than M35 for RCC but this was not at the time of construction.
- The half-cell potentials in the visually good locations and moderate location of the RC Diaphragm wall are between -200 mV to -350 mV indicating that the corrosion activity of the reinforcing steel in the area is uncertain at the time of measurement as per the reference guidelines of ASTM C-876. Hence, the RC Diaphragm wall may be regularly inspected to check for possible distress/corrosion of the steel rebar to take up the required mitigation measures as of when required.
- The half-cell potentials, in portions of Diaphragm wall which showed signs of visual distress of the RC Diaphragm wall are above -350 mV indicating that there is a greater than 90 % probability that reinforcing steel corrosion is occurring in that area at the time of measurement as per the reference guidelines of ASTM C-876.
- The chloride contents drawn from the selected locations of the RC Diaphragm wall of the CQ-II berth are between 0.60 kg/m³ and 3.01 kg/m³ compared to a permissible value of 0.6 kg/m³ at the time of placing as specified in IS: 456-2000. In view of the prevailing Marine environment, the chloride levels are on the higher side and hence the CQ-II berth may be regularly inspected to check for possible distress/corrosion of the steel rebar and timely repair wherever required.
- The pH of the concrete samples in the RC Diaphragm wall varying from 11.63 and 12.07, which indicates availability of alkalinity. Though is lower than the pH value of 13 for fresh concrete, corrosion of steel will be significant only if pH value falls below 7 and hence this parameter value indicates the concrete is in good condition and will protect the steel reinforcement inside it.
- It recommended that the minor distresses noticed in the RC Diaphragm wall on the berthing face above water level may be rehabilitated using Polymer modified mortar.

Signature Not Verified

Digitally signed by ALOK MOHANTY
Date: 2026.03.26 16:23:23 IST
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